Description

Yarn clearer

The invention relates to a yarn clearer according to the preamble of claim 1.

In the production of yarn, as high a uniformity as possible of the yarn is generally aimed for within narrow tolerances as well as a yarn without visible defects, such as intolerable thick or thin locations in the yarn. In order to achieve this, so-called yarn clearers are used, which, for example, monitor the diameter of the yarn continuously with a measuring head which operates contactlessly. If, owing to the exceeding of limit values called cleaning limits, an intolerable defect is detected, the defect is cut out of the yarn, the yarn ends are connected again and the production process is continued, as known, for example from DE 10062479 A1.

In conventional yarn monitoring, a single reference diameter is determined and cleaning limits selected for this. For example it is known from the literature reference "Elektronisches Garnüberwachungssystem Corolab für Rotor-Spinnspulautomaten Autocoro", Chemiefasern/Textilindustrie, 40th/92nd Volume, April 1990, in order to determine a reference diameter, to determine an average diameter value of the yarn at the beginning of the measurement at a spinning station over the first yarn metres. This so-called reference diameter is the reference diameter for all further evaluations. Measured actual diameters of the yarn are generally given as a percentage based on the reference diameter.

The object of the invention is to propose a clearer with an enlarged area of application.

This object is achieved with a yarn clearer with the features of claim 1.

Advantageous configurations of the invention are the subject of the sub-claims.

The yarn clearer according to the invention makes it possible to recognise diameter-related yarn defects even in effect yarn. The fluctuations in the yarn parameter, which are caused solely by the change between the webs and effects, do not result in unnecessary cutting processes, which would reduce the productivity and create undesired connection locations.

If different cleaning limits are specified for the web and effect, the determination of effects can take place virtually as precisely as in a yarn free of effects (claim 2).

The clearer functions known *per se*, can therefore be extensively used so a satisfactory evaluation of the effect yarn produced is possible (claim 3).

If, in an effect yarn, defects can be either tolerated in the web regions or defects can be tolerated in the effect regions, the yarn clearer can be set up according to claim 4. The selection of only the effects can be justified in that satisfactory web formation is assumed, but the effect formation is not reliable enough. If, as an alternative, it can be assumed that differences in the effect formation are of no consequence, it may be sufficient if only the longer web

sections are cleaned, analogously to a regular yarn. With the restriction to one alternative, the calculating outlay required for the cleaning and the number of cutting processes can be reduced.

The diameter of the effect yarn is used as a priority as the yarn parameter, with the cleaning limits being different depending on the respective measuring location, in other words web or effect.

The web diameter, also called the web thickness, can be determined with a yarn clearer according to claim 8, largely uninfluenced by the effects and therefore close to reality. This also has a positive effect with regard to the accuracy of detecting the effect.

With a yarn clearer according to claim 9 a relatively simple but adequately precise determination of the effect limits is possible.

In the development of the yarn clearer according to claim 10, an average value for the effects, which is set too low, is counteracted. On the one hand, an average value, which is set low, could lead to undesired cuts when the effect is strongly pronounced, partially deliberately. On the other hand, an inadequate differentiation of the cleaning limits between the effect and web would exist.

With a yarn clearer according to claim 9 and 11, the limit between the web and effect can be determined with adequate accuracy for cleaning the effect yarn.

If lower demands are placed on the cleaning of an effect yarn with regard to maintaining the diameter, a yarn clearer set up according to claim 12 may be adequate. With a yarn clearer of this type, the outlay required for cleaning the effect yarn can be reduced. On the other hand, it is nevertheless ensured that unnecessary steps, which are brought about by effect-caused diameter fluctuations, are not carried out. A clearer of this type is adequate particularly when the effects are not particularly strongly pronounced.

The invention will be described in more detail with the aid of an embodiment. In the drawings:

Fig. 1 shows a simplified schematic view of a workstation of a spinning winding machine,

Fig. 2 shows an effect yarn, which is shown by the arrangement side by side of measured values of the yarn diameter,

Fig. 3 shows a basic view of an effect region with adjacent web parts.

In the spinning station shown in Fig. 1, the effect yarn 1 is drawn off from the spinning device 3 through the draw-off tube 2 and wound onto the cross-wound bobbin 4. The effect yarn 1 runs between the spinning device 3 and cross-wound bobbin 4, through a yarn clearer 5, which comprises a measuring head 6 and a processor 8, and subsequently a guide eyelet 9. The yarn clearer 5 is allocated a thread guard 7. The drive drum 10 drives the cross-wound bobbin 4 during the winding process by means of frictional engagement. A motor 11 provides the drive drum 10 with rotational movement. The yarn clearer 5 is used

for quality monitoring of the running effect yarn 1. The yarn clearer 5 is connected to further mechanisms for control, data storage or evaluation and for the activation of further elements of the spinning station or the spinning machine, by means of the line 12. The components of the yarn clearer 5 can be integrated in a common housing.

Alternatively, the effect yarn may also be drawn from a supply bobbin instead of from a spinning device.

Fig. 2 shows the view of the effect yarn 1 as an arrangement side by side of measured values. The regions of the effects 13 and the webs 14 can be seen but the beginning and end of the effects 13 and the effect thickness or the effect diameter D_E and the web thickness or the web diameter D_{ST} are not clear and therefore cannot be adequately recognised.

The yarn clearer 5 records the yarn diameter D in each case at a spacing of 2 mm. A cycle represents a measuring length of 2 mm of effect yarn 1. To determine the web diameter D_{ST} used as a basis for the cleaning, the clearer 5 initially forms, at the beginning of the measurement, an arithmetic average value of the yarn diameter from a predetermined length of effect yarn 1 as the reference diameter, subtracts the reference diameter from the measured individual values of the yarn diameter and forms the average value of the web diameter D_{ST} as the arithmetic average value from all the negative differential values, which have been measured adjacent to other negative differential values.

The determination of the effect diameter D_E and the limits between the effects 13 and webs 14 is explained with the aid

of Fig. 3. In the view of Fig. 3, the yarn diameter D is shown as a percentage over the yarn length L_G as the curve 15. The curve 15 represents, in the view of Fig. 3, beginning from the left up to the point 16, the web diameter D_{ST}. From the point 16, the curve 15 rises and, at point 17, passes the value of the limit diameter D_{GR}. At point 18, the predetermined yarn length L_V has been covered since reaching the point 17. After a diameter increase of 15% is recorded at the point 17, and the exceeding of the limit diameter D_{GR} lasts over the predetermined length L_V, for example for six cycles or 12 mm, the point 17 is defined as the beginning of the effect 13. The curve 15 falls below the limit diameter D_{GR} at the point 19. The falling below lasts up to point 20 and therefore over the predetermined yarn length L_V. Therefore, the point 19 is defined as the end of the effect 13. The region between point 17 and point 19 is defined as the effect 13. The section of the effect yarn 1 following after point 19 or the end of the effect 13 is defined as web 14 until a beginning of an effect 13 is determined again.

An arithmetic average value is formed from the four largest diameters 21 within the effect 13. The provision of the effect diameter D_E is thus largely independent of natural diameter fluctuations in the effect region. This arithmetic average value is defined as the effect diameter D_E.

A predetermined tolerance range with a cleaning limit RG_{EO} as the upper limit value and with a cleaning limit RG_{EU} as the lower limit value, is allocated to the effect diameter D_E. A predetermined tolerance range with a cleaning limit RG_{STO} as the upper limit value and with a cleaning limit RG_{STU} as the

lower limit value is accordingly allocated to the web diameter D_{ST}.

The yarn clearer 5 continuously determines whether the diameter values of the effect yarn 1 detected by the measuring head 6 originate from a region which is defined as a web 14 or as an effect 13. If the diameter values of the effect yarn 1 originate from a region, which is defined as a web 14, these diameter values are compared with the limit values allocated to the web diameter D_{ST}, the cleaning limit RG_{STO} and the cleaning limit RG_{STU}. If the diameter values of the effect yarn 1 originate from a region, which is defined as an effect 13, these diameter values are compared with the limit values allocated to the effect diameter D_E, the cleaning limit RG_{EO} and the cleaning limit RG_{EU}.

Alternatively, the yarn clearer 5 can be set up in such a way that, alternatively, either only defects in the web regions or only defects in the effect regions are cleaned out.

Alternatively, the cleaning limits of the yarn clearer 5 can be set up in such a way that they lie outside the fluctuation width B_S identified in Fig. 3, of the effect 13 and web 14. The fluctuation width B_S designates the spacing between the diameter of the effect 13 and the diameter of the web 14. In this case, the continuously measured diameter values of the effect yarn 1 are compared, for example, only with the cleaning limit RG_{EO} and the cleaning limit RG_{STU}, in order to detect exceeding. The cleaning limit RG_{EO} designates the upper tolerable limit value of the effect diameter D_E and the cleaning limit RG_{STU} designates the lower tolerable limit value of the web diameter D_{ST}.

In a first embodiment, the yarn clearer 5 is set up in such a way that exceeding these limit values or cleaning limits is recorded as an intolerable defect and the latter is cut out.

In a second embodiment, the yarn clearer 5 is alternatively set up in such a way that when these limit values or cleaning limits are exceeded, it is detected over what yarn length the exceeding lasts. A decision is made by means of a two-dimensional classifying matrix known *per se*, also called a clearer matrix, as to whether an intolerable defect is present and, in this manner, the defect lengths are included in the determination of the cleaning limits. A classifying matrix is divided in one dimension into length regions and, in the other dimension, into diameter regions and, in each case, forms a class by the combination of one length region with one diameter region. The cleaning of yarn according to classes has been known for a long time, for example from the literature reference "Vollständiges System zur Qualitätssicherung in der Spulerei", Melliand - offprint October 1992.

Further embodiments of the yarn clearer are possible in the framework of the invention and not limited to the embodiment shown.